

Analysis of Anomalous Variations in High Altitude Balloon Ascent Rates near the Tropopause

Walter Taresh*, Kevin Ramus, Kim Baird, Carlos Gonzalez, Gabe Wilson, Rory Riggs, George Korb, David H. Atkinson, and the Idaho Near Space Engineering Team

University of Idaho

e-mail: tare9527@vandals.uidaho.edu

ABSTRACT

High altitude balloons provide a simple, inexpensive, and reliable means of studying planetary atmospheres. In recent balloon flights conducted by the University of Idaho's RISE (Research Involving Student Engineers) Near Space Engineering program, the ascent rate and trajectory of the balloon path has been a major concern. Anomalous variations in ascent rate have been observed near the tropopause on recent flights. Simple models indicate that ascent speed should be essentially constant with altitude. However, near the tropopause a virtually instantaneous reduction in ascent rate of approximately 50% has been observed. Several possible phenomena to explain this effect are being studied, including changes in drag coefficient near Reynolds number of 3×10^5 and a temperature induced loss of buoyancy due to cooling of the lifting gas during adiabatic expansion of the balloon in the near-isothermal layer above the tropopause (temperature drag effect).